Conceptual

1.) A

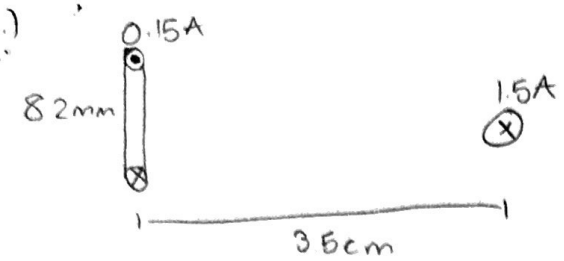
2.) b

3.) c

4.) c

5.) c

1.)



a.)

$$B_w = \frac{\mu_0 I}{2\pi d}$$

$B_w = 8.57 \times 10^{-6}\ T\ \hat{J}$

$I = 1.5A$

$d = 3.5 \times 10^{-2} m$

b.) $\mu = IA$

$\mu = 7.92 \times 10^{-6}\ Am^2, \uparrow$

$I = 0.15A$

$A = \pi r^2$

$\pi (4.1 \times 10^{-3} m)^2$

c.)

$$B_L = \frac{\mu_0}{2} \frac{IR^2}{(z^2+R^2)^{3/2}}$$

$B_L = 3.62 \times 10^{-8}\ T\ \uparrow$

$I = 0.15A$

$R = 4.1 \times 10^{-3} m$

$z = 3.5 \times 10^{-2} m$

d.) $T = \mu \times B$

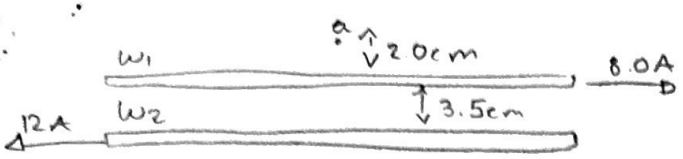
$T = \mu B \sin\theta$

$\theta = 90°$

$7.92 \times 10^{-6} Am^2 (8.57 \times 10^{-6} T) = 6.8 \times 10^{-11} nm$

$T = 6.8 \times 10^{-11} nm$

2.



a) $B_w = \frac{\mu_0 I}{2\pi d}$

$B_{w_1} = 7.99 \times 10^{-5}\ T\ \hat{k}$

$I = 8.0A$

$d = 2.0 \times 10^{-2} m$

b) $B_w = \frac{\mu_0 I}{2\pi d}$

$B_{w_2} = 4.36 \times 10^{-5} T\ -\hat{k}$

$I = 12A$

$d = 5.5 \times 0^{-2} m$

c) $B_{w_1} - B_{w_2} = 3.63 \times 10^{-5}\ T\ \hat{k}$

$B_N = 3.63 \times 10^{-5}\ T\ \hat{k}$

d) $F = qV \times B$

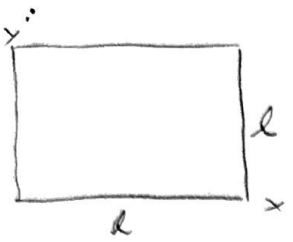
$V = \langle 1.2 \times 10^6, 0, 0 \rangle$

$B = \langle 0, 0, 3.63 \times 10^{-5} \rangle$

$q = -1.602 \times 10^{-19} C$

$F = 6.97 \times 10^{-18} N\ \hat{j}$

3.



$\ell = 0.15m$ $\quad \vec{B} = (0.32t)\hat{i} + (0.54t^2)\hat{k}$

$R = 0.55\Omega$ $\quad \Phi = B \cdot A$

a.)

$$A = 0.15\hat{\uparrow} \times 0.15\hat{j} = 0.0225\, m^2\hat{k}$$

$$((0.32t)\hat{\uparrow} + (0.54t^2)\hat{k}) \cdot (0.0225m^2\hat{k}) = 0.01215t^2$$

$$\Phi = 0.01215t^2\hat{k}\ Tm^2$$

b.) $I = \frac{\varepsilon}{R}$

$$\varepsilon = \left|\frac{d\Phi_m}{dt}\right| \qquad \frac{d\Phi_m}{dt} = 0.0243t\ Tm^2$$

$$\frac{d\Phi_m}{dt}(0.50s) = 0.01215\ V$$

$$I = \frac{0.01215V}{0.55\Omega} = 0.022091\ A$$

$$I = 2.2 \times 10^{-2} A$$

4.) $I_0 = 350\ W/m^2$ unpolarized $\therefore \frac{1}{2} I_0 = I_0$

a.)

$$I_0 = 175\ W/m^2$$

b.) $I = I_0 \cos\theta^2$

$I = 131\ W/m^2$

$I_0 = 175\ W/m^2$

$$\frac{I}{I_0} = \cos^2\theta$$

$$\sqrt{\frac{I}{I_0}} = \cos\theta$$

$$\theta = \cos^{-1}\left(\sqrt{\frac{I}{I_0}}\right) = 30.09^\circ$$

$$\theta = 30.09^\circ$$